Selected Near-Term Technology Needs at the Hanford Site

S. W. Petersen (swpeters@bhi-erc.com, (509)372-9126)

Bechtel Hanford, Inc.
3350 George Washington Way, MSIN H0-02
Richland, WA 99352

The Hanford Site in south-central Washington is approximately 1,450 km^2 (560 mi^2) of semi-arid shrub and grasslands. From 1943 to 1989 the production of plutonium and management of the resulting wastes were the principle activities at the Site. For the last ten years, work on the Site has concentrated on environmental restoration and waste management.

Environmental remediation at Hanford poses several significant challenges that may be met by employing new technologies. These challenges include

- Characterization of many different chemicals and radionuclides deep in the vadose zone and in the groundwater, which is as deep as 75 m (250 ft) below ground surface.
- Remediation of contaminants deep in the vadose zone and groundwater.
- Accessing vadose zone and groundwater for characterization and In Situ remediation in difficult geologic conditions.
- Rapid and accurate field screening of soils and debris while excavating, to guide remediation and designate waste.
- Remote identification of burial ground contents.

There are currently 24 needs associated with subsurface contamination for the Hanford Site. These needs can be accessed on the internet (http://www.pnl.gov/stcg/) and are also contained on a CD-ROM (available from the author). While it is important to find solutions for all of these needs, three are discussed here because of the need for near-term solutions. These are presented below with the need number and short descriptions.

Needs:

RL-SS10, Improved Technologies for Detection/Delineation of Burial Ground Contents and Subsurface Geological Boundaries. A large number of burial grounds and liquid waste disposal sites were created during almost 50 years of defense plutonium production. Documentation of materials that were placed in the burial grounds and the exact location of some sites is incomplete. In addition, many of these sites have been interim stabilized with 5 to 15 feet of fill material. Improved technologies are needed for non-intrusive or minimally intrusive methods for identifying the contents of these burial grounds, delineating difficult-to-find waste sites, and identifying geological boundaries. **Baseline:** Ground-penetrating radar, electromagnetic induction, test pits/trenches, visual examination.

Priority: Critical to the success of "Accelerated Cleanup: Paths to Closure."
Benefits: Would provide accurate information for characterization and remedial action planning and eliminate invasive sampling. Unexpected waste found during excavation of the first two burial grounds at the Hanford Site have led to unplanned delays and increased costs of nearly $1M over the planned budget. Preventing these delays for the 45 to 100 buried wastes sites that may eventually require excavation would result in significant cost savings.
Schedule: Needed in the near term

RL-SS25, Improved, Cost-Effective Methods for Subsurface Access to Support Characterization and Remediation. The Hanford Site contains large volumes of contaminated vadose zone and aquifer soils. In some areas, these soils are located at depths of 500 ft, while access to other soils is restricted by the presence of surface or near-surface objects such as buildings or underground tanks. The Hanford Site geology also is quite varied and ranges from unconsolidated silty sands to gravels and cobbles. Cost-effective technologies that allow access to this wide variety of sediments for both characterization and remediation are required.
Baseline: Various drilling methods including air rotary, sonic, and cable tool.
Priority: Critical to the success of "Accelerated Cleanup: Paths to Closure."
Benefits: Cost-effective access methods would allow reduction in size of several of the large subsurface plumes (e.g., carbon tetrachloride) by utilizing In Situ remediation techniques. Access to soil under contaminated engineered structures (by use of horizontal drilling, for example) for characterization and remediation would reduce worker exposure and secondary contamination (i.e., drag-down of contaminated soil)
Schedule: Needed now

RL- SS13 through RL-SS16, RL-SS26. Improved, real-time field screening during excavation and In Situ characterization for heavy metals and radionuclides. Millions of cubic yards of soil are slated for excavation and disposal at the Hanford Site. Field screening techniques are needed to detect radionuclides to guide excavation, and to quickly and effectively analyze excavated soil for various metals for waste disposal (i.e., to meet TCLP requirements). In Situ characterization techniques are needed to determine the disposition of waste sites and guide remediation activities.
Baseline: Gamma detectors and discrete sampling for radionuclides; discrete sampling and laboratory analysis for metals.
Priority: Provides substantial benefit to "Accelerated Cleanup: Paths to Closure."
Benefits: Detecting low levels of gamma-emitting radionuclides in the field will reduce worker exposure and improve excavation efficiency. Rapid field screening for metals will reduce worker exposure and help ensure that soils that do not meet Land Disposal Requirements are properly managed. Cost-effective In Situ measurement techniques will also aid in dispositioning sites, as some sites currently listed as contaminated may in fact be clean.
Schedule: Needed now